Appl. No. 10/605,537
Response dated 09/02/2005
Reply to Office Action of 03/02/2005

AMENDMENTS TO CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1 –16. (cancelled)

17. (new) A multi-compartment microfluidic device for enabling fluidic isolation among interconnected compartments within the device comprising:

a micropatterned substrate coupled with an optically transparent housing;

said optically transparent housing comprising a first microfluidic region having a first entry reservoir for accepting a first volume of fluid;

said optically transparent housing further comprising a second microfluidic region having a second entry reservoir for accepting a second volume of fluid that is less than said first volume of fluid to create hydrostatic pressure;

a barrier region that couples said first microfluidic region with said second microfluidic region to enable a biological specimen to extend across said first microfluidic region, said barrier region and said second microfluidic region; and

said barrier region comprising at least one embedded microgroove having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid via said hydrostatic pressure maintained via said at least one embedded microgroove.

18. (new) The multi-compartment microfluidic device of claim 17 wherein said first microfluidic region and said second microfluidic region are dispose parallel to one another and coupled with said barrier region.

19. (new) The multi-compartment microfluidic device of claim 17 wherein said hydrostatic pressure results from higher resistance to flow due to the size differences between said first and second microfluidic regions and said at least one embedded microgroove.

20. (new) The multi-compartment microfluidic device of claim 17 further comprising a plurality of embedded microgrooves configured to extend between said first microfluidic region and said second microfluidic region.

21. (new) The multi-compartment microfluidic device of claim 17 wherein said at barrier region comprises a length of not less than 50 μm.

22. (new) The multi-compartment device of claim 17 wherein said at lest one embedded microgroove comprises dimensions less than 10 μm in height.

23. (new) The multi-compartment microfluidic device of claim 17 wherein said biological specimen comprises a cellular structure.

24. (new) The multi-compartment microfluidic device of claim 23 wherein said first volume of fluid is applied to a first somal domain of said cellular structure and said second volume of fluid is applied to a cytoplasmic domain of said cellular structure.

25. (new) The multi-compartment microfluidic device of claim 23 wherein said cellular structure comprises nerve cells.

26. (new) The multi-compartment microfluidic device of claim 25 wherein said first volume of fluid is applied to a first somal domain of said nerve cell and said second volume of fluid is applied to an neuritic region of said nerve cell.

27. (new) The multi-compartment microfluidic device of claim 26 wherein said first somal domain comprises a nerve cell body.

28. (new) The multi-compartment microfluidic device of claim 26 wherein said neuritic region comprises an axonal domain.

29. (new) The multi-compartment microfluidic device of claim 28 wherein said barrier region selects for said axonal domain of said neuritic region of said biological specimen by comprising a length of 400 μm or more.

30. (new) The multi-compartment microfluidic device of claim 25 wherein synapses of said nerve cell are isolated in said second microfluidic region.

31. (new) A multi-compartment microfluidic device for enabling fluidic isolation among interconnected compartments within the device comprising:

a micropatterned substrate coupled with an optically transparent housing;

said optically transparent housing comprising a first microfluidic region having a first entry reservoir for accepting a first volume of fluid and a first reservoir where said first volume of fluid flows from said first entry reservoir to said first reservoir;

said optically transparent housing further comprising a second microfluidic region having a second entry reservoir for accepting a second volume of fluid and a second reservoir where said second volume of fluid flows from said second entry reservoir to said second reservoir, said first volume of fluid being greater than said second volume of fluid to create hydrostatic pressure;

a barrier region that couples said first microfluidic region with said second microfluidic region to enable a biological specimen to extend across said first microfluidic region, said barrier region and said second microfluidic region; and

said barrier region comprising at least one embedded microgroove having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid via said hydrostatic pressure maintained via said at least one embedded microgroove.

32. (new) A multi-compartment microfluidic device for enabling fluidic isolation among interconnected compartments within the device comprising:

a micropatterned substrate coupled with an optically transparent housing;

said optically transparent housing comprising a first microfluidic region having an first entry reservoir for accepting a first volume of fluid;

said optically transparent housing further comprising a second microfluidic region having a second entry reservoir for accepting a second volume of fluid that is greater than said second volume of fluid to generate hydrostatic pressure;

a barrier region that couples said first microfluidic region with said second microfluidic region to enable a nerve cell to extend across said first microfluidic region, said barrier region and said second microfluidic region, wherein said first volume of fluid is applied to a first somal domain of said nerve cell and said second volume of fluid is applied to a neuritic region of said nerve cell;

said first microfluidic region and said second microfluidic region being dispose substantially parallel to one another and said barrier region comprising a plurality of embedded microgroove having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid via said hydrostatic pressure maintained via said plurality of embedded microgrooves, said hydrostatic pressure resulting from higher resistance to flow due to said plurality of embedded microgrooves having less of a fluid capacity than either of said first and second microfluidic regions.

33. (new) The multi-compartment microfluidic device of claim 32 wherein synapses of said nerve cell are isolated in said second microfluidic region.

34. (new) The multi-compartment microfluidic device of claim 32 wherein said first somal domain comprises a nerve cell body.

35. (new) The multi-compartment microfluidic device of claim 32 wherein said neuritic region comprises an axonal domain.

36. (new) The multi-compartment microfluidic device of claim 32 wherein said barrier region selects for said axonal domain of said neuritic region of said biological specimen by comprising a length of 400 μm or more.

37. (new) The multi-compartment microfluidic device of claim 32 wherein said at barrier region comprises a length of not less than 50 μm.

38. (new) The multi-compartment microfluidic device of claim 32 wherein said plurality of microgrooves have dimensions less than 10 μm in height.